THE ELEMENTARY SCHOOL TEACHER
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THE SCHOOL GARDEN.

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THE school garden is a useful accessory in the study of nature, whether considered from the æsthetic, the economic, or the botanical point of view. The first named doubtless offers the strongest attractions to both teacher and pupils, but it is by no means the most important aspect of the subject. For without due regard to the habits of plants, their special adaptations to soil, light, heat, air, and to each other, the garden certainly cannot grow into a thing of beauty. No amount of skill bestowed upon the beds and walks can make up for a lack of harmony—happiness one might say—among the plants themselves. The moderate scale upon which most school gardens must be planned precludes the possibility of the development of much economic value, except so far as a variety of useful plants may be grown with a view to illustrating some of the many different plant structures upon which man so largely depends for food and clothing.

The chief reason why the school garden often falls short of the hopes of those who plan for it is that its projectors usually greatly underestimate the attention and labor which it should receive. Gardening is one of the highest arts, and there can be no more serious mistake than to suppose it is only necessary to plant the seeds and let them grow. Bacon said long ago that

men come to build stately sooner than to garden finely. It should be remembered in the outset that, in several senses, a garden represents a war with nature as the latter term is usually understood.

In the first place, it is commonly made up of plants that have been drawn from remote parts of the earth, often from places having diverse climatic conditions. These are all expected to grow within a limited area for which, naturally, they are not specially suited, and their "personal" objections are supposed to be overcome chiefly by artificial means and by processes known as cultivation and forcing. Cultivated plants can never be made to forget the ancient haunts of their ancestors. The one, therefore, that flourished best in primeval times in marshy soil will never feel quite at home in a dry, loamy garden alongside of a plant that has been enticed away from a sandy ridge. Nor will a plant which has been kidnaped from a warmer climate take kindly to a yoke-fellow that has spent countless ages in learning how to outwit the north wind.

In the second place, almost every cultivated plant may be regarded as either a freak or a genius; usually it exhibits all the eccentricities of both types. Man, in looking selfishly after his own ends, in many instances has seriously interfered with the ancient and prosaic process of seed production, which comprises the whole of a plant's ambition in the wild state. Even where the want of the gardener and the need of the plant meet in the same thing, as in the seed, in some underground forms and in many flowers, these parts are forced by the tricks of cultivation to a point in size and numbers that the plants could not sustain for a single season if they were left to battle alone with the elements and with their natural enemies. Thus, the potato, as well as the turnip, parsnip, and other roots; the cabbage, kale, kohlrabi, and other leaves and stems; the peas, beans, and other seeds, in their present marketable form, represent the ambition of the gardener rather than the needs of the plants themselves. The distortion and exaggeration of the normal form found in the majority of cultivated plants represent with fair directness the modification of the natural conditions under which these

plants are produced. If members of the vegetable world were endowed with reflective powers, they would certainly view some of the results obtained by the gardener with alarm; as, for example, the production of the "seedless fruit" and the double flower, in which the original purpose of this particular part is entirely defeated.

Again, it should be remembered that cultivated plants are not only herded together without much regard for their natural affinities, but they are set down in a place which in most cases was pre-empted ages ago by other plants that have learned thoroughly how to take care of themselves on that particular spot. It has been part of the business of these plants to kill off without mercy all members of any weakling tribe that might appear among them. The enormous strength with which these "natives" literally hold their ground is evidenced by the fact that the gardener's favorites must be aided and protected by the active and vigilant use of the best instruments yet devised by the wit of man for the extermination of weeds in order to carry the cultivated crop to a successful issue. There is no more striking illustration than this of the trouble one may expect if he interferes with one of nature's established ways.

In designing a garden in connection with an ordinary school, therefore, three things should be observed: (1) Select plants which do not represent a wide diversity of habit unless the garden will lend itself to a variety of conditions as to water, sunshine, and soil; (2) select plants which represent fairly well-established stages of cultivation, that is, avoid the so-called novelties unless there is ample provision for unusual attention; (3) allow plenty of time for systematic care; odds and ends of time will not do; the weeds do not grow by fits and starts.

For the æsthetic effects of a garden most people will depend upon the flowers and ornamental foliage plants. Several arrangements may be suggested which will commend themselves according to the taste and opportunities of different individuals.

In the plan shown in the March number it is proposed to use the central circular space for the flowers, giving a wedge-like section to each grade. At the inner end of each bed there will be planted a castor bean; at a suitable

distance from this, moving outward, there will be a calladium; next there will be a ring of salvias, then cornflowers, verbenas, and a border of phlox or sweet alyssum. By this selection and distribution the bed will have the two features of ornamental foliage and flowers which is made possible by its large size. The flowering will begin rather early and, by the choice of plants, will be continued until frost. The order decided upon will give each different kind of plant a fair opportunity for growth.

The four adjacent areas on either side of the flower bed — one for each grade — will be devoted to plants selected for their economic value. Such plants have been selected as will be useful in preparing the children's luncheons next year. To this end each plot, twenty feet square, will be devoted to one or two kinds of plants, and the grade caring for it will be responsible to the entire school for the result. The plants chosen are beans, peas, potatoes, cabbage, carrots, parsnips, beets, tomatoes, turnips, onions, peppers, cucumbers (for pickles), and corn. Radishes and lettuce will be sown in certain spots not available for other plants. It is proposed here to show, for example, the great debt of mankind to the *cruciferae*. There is no part of the plant body that has not been developed in different members of this useful family for the food of man. Thus, in the turnip and radish, the root; in the cabbage, the leaves. The *solanaceae* will be represented by the tomato, potato, and pepper, the innocuous but useful relatives of the poisonous nightshade. The parsnip and the carrot will represent the *umbelliferae*, and beets will strive for the ascendency with their wild and vigorous relative, the pigweed of the goosefoot family, or *chenopodiacae*. The peas and beans are the favorites chosen from the *Legumuinosae*, an interesting family of plants, both useful and ornamental.

The four areas at the opposite ends of the garden will be devoted to various members of the grass family — maize, wheat, oats, rye, barley, broom corn, and sorghum, and a small strip will be sown with flax. Later in the season some space must be found for buckwheat, the most useful member belonging to that family of gutter snipes, the smartweeds. The same aspects for study will be presented by the plants cultivated for their flowers.

In connection with this part of the garden work there are three interesting lines of study: (1) The original habits of the plant in its wild state, and its near relatives that now may be found growing wild; (2) the steps in cultivation and the conditions provided which have developed the cultivated form; (3) the nature, constitution, the relative value, and the distribution of the food product thus obtained.

Another point of view from which the garden as a whole will be studied is from that of the actual problems which the

different plants must solve in the process of growth during different periods of the season. These problems are alike to all the plants cultivated in the garden, though differing somewhat in degree of importance. They arise mainly (1) from the plant's efforts to establish helpful relations with sunshine, meaning both light and heat; (2) with the soil for support and as a water reservoir, as well as for the sake of small quantities of minerals; and (3) with the atmosphere as a reservoir of oxygen and food supply.

The clew to a solution of the problems falling under (1) and (3) will be found chiefly in a study of the leaves, including their mode of attachment, their position, relative size, shape, margin, arrangement, structure, and movements. The problems involved in (2) are to be worked out through careful observation of the root, beginning when it leaves the sprouting seed.

Certain movements of the plants will be shown by the various kinds of climbers that are to be trained up the walls of the schoolhouse. The amount of work done by the plants may be approximately calculated from data gathered by growing plants under special conditions. Thus, the amount of water discharged through the leaves may be found by growing a plant in a wide-mouthed bottle closed about the stem so as to prevent evaporation. By weighing at intervals, placing the plant now in sunshine, now in shade, the loss noted will be from transpiration, and the quantity of water can be measured out so the pupils may see it. Plants may be weighed fresh and afterwards dried and weighed again, then burned, thus giving an idea of the water and of the dry, solid, and mineral matter built up during any given period of its development.

Again, the resources upon which the plant must draw for materials may be investigated through a study of the soil, rainfall, temperature, slant and distribution of the sunshine. The gist of the whole study under this head is (1) to see how the plants suit their problems to the seasons: germination to the cool, moist April and May; the rapid development of leaf and flower to the long, bright, hot days of June and July, and the filling up of the seed to the early autumn; and (2) to observe

how they manage to resist the encroachments of each other and to use each as they all together take possession practically of the whole earth.

REFERENCES: Bailey, *Garden Making;* Coulter, *Plant Relations; Origin of Cultivated Plants.*

THE INDIVIDUAL ELEMENT IN THE TEACHING OF ARITHMETIC.

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IN educational gatherings, where the teaching of arithmetic is discussed, we are often told how this, that, or the other teacher has found the children attack an arithmetical topic. We are often given the precise form of the child's questions. The certainty with which teachers assure us that they have found the true method of the child, together with the contradictory character of their discoveries, leads us to doubt seriously whether we shall ever arrive at an agreement as to what "the method of the child" really is. There are those who doubt whether there exists any single method in arithmetic which may be regarded as "the method of the child." It seems quite clear from the questions of arithmetic classes that we may speak of "methods of children;" but this is a very different thing from "*the* method of the child," as commonly understood.

We recognize in theory that a peculiar caste of mind—a particular bent—arises from the particular environment and antecedent training of each pupil; but this does not seem to lay vital hold of our class-room practice in the elementary mathematics. Indeed, the teacher's conception of his office as teacher may be pretty accurately gauged from the extent to which he allows the individual element to control his practice. If this element control but slightly, he will regard his function as that of a taskmaster, to dole out to his imaginary average pupil the daily stint and then to act as a recitation post on the morrow. The text-book, which, in the nature of the case, must present its subject-matter largely with reference to the average pupil, must do the teaching. The taskmaster may even go so far as to